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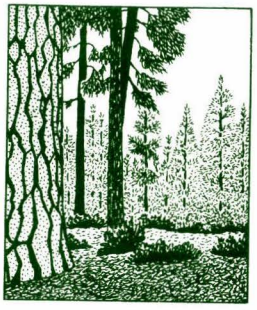

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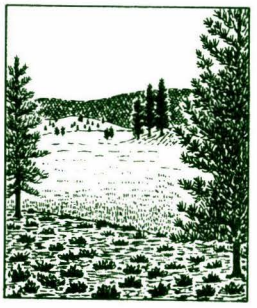

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KILLING BRUSH SPROUTS ON OPEN WOODLAND RANGE IN CALIFORNIA[1/]

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How to kill sprouting brush species remains the most serious problem for any stockman planning to clear his foothill range of low value brush. The common practice is to remove tree and shrub growth by controlled burning and kill the new brush seedlings by reburning. But reburning does not destroy the sprouts of oaks and certain other species. They develop vigorously after the parent shrubs or trees are destroyed by fire and soon reoccupy the land unless they are killed. Slashing and browsing combined with reburning occasionally are effective for this job, but on the whole these hard-to-kill sprouts greatly hamper efforts of stockmen to clear their range permanently.

Research several years ago showed that hormone-type chemicals would kill sprouting brush. For the hard-to-kill species, however, the chemical had to be carefully applied to individual plants rather than as a broadcast spray. Even then, results from many field plots were disappointing because of poor spray coverage. Repeated treatment appeared to be the key to success with available chemicals. Consequently, a trial was started at the San Joaquin Experimental Range in 1953 to determine how many annual applications were needed to control brush sprouts effectively in open woodland.[2/] The test has shown that chemical sprays can be combined effectively and practically with burning to convert brush ranges into stable grasslands.

1/ Based on the article "BRUSH KILLING-- Burning-spraying combination does the job effectively, economically," by Charles A. Graham, carried in the 1958 YEARBOOK of the WESTERN LIVESTOCK JOURNAL. Reproduced by permission of the WESTERN LIVESTOCK JOURNAL.

2/ The chemicals and formulation use in this pilot test were recommended by Dr. Oliver Leonard of the Botany Department of the University of California.

The California Forest and Range Experiment Station is maintained at Berkeley in cooperation with the University of Calif

THE PILOT FIELD TRIALS

A 16-acre area upon which the brush had been crushed and burned in July 1952 was selected for the spraying test. All new sprouts of interior live oak (Quercus wislizenii), blue oak (Q. Douglasii), and redberry (Rhamnus crocea var illicifolia) were first sprayed in April 1953 then resprayed in June of 1953, 1954, and 1955. The second application in June 1953 was necessary because many new sprouts started after the early spraying. The clumps of live sprouts were counted each year as they were sprayed. A final count to determine the number of live plants of each species remaining, was made on April 18, 1956.

The chemicals used were low-volatile heavy esters (butoxy ethenol ester) of 2,4-D (2-4-Dichlorophenoxyacetic acid) and 2,4,5-T (2-4-5-Trichlorophenoxyacetic acid). They were applied singly and in a "brushkiller" mixture containing equal parts of 2,4-D and 2,4,5-T. Each chemical was used as a 2 percent acid-equivalent solution (by weight) in an emulsion containing a 1 percent diesel oil in water. The 2,4-D and the brushkiller were each sprayed on all sprouting plants on a 5-acre area. A 6-acre area was sprayed with 2,4,5-T.

An average of slightly less than one-fourth pint of spray solution was required to thoroughly wet all leaf surfaces on each clump of first-year sprouts. A 3-gallon back-pack sprayer equipped with a fan type tee-jet (8004) nozzle was used.

Each year's spraying was done by a different college student. They were given minimum training and supervision during the job.

THE RESULTS

All herbicides gave satisfactory kill of the sprouts by the end of the third year of the spraying (table 1). The butoxy ethenol ester of 2,4,5-T was more effective than that of 2,4-D in killing live oak and redberry sprouts. The 2,4-D appeared to be superior for killing blue oak. Best overall control was with the combination of the two chemicals, a finding that agrees with the general recommendation to use "brushkiller" in spring on mixtures of species.

Three sprayings are definitely needed for complete sprout control with these three species. Theoretically, nearly all sprouts could be killed by one or two thorough coverages of spray, but such results could not be expected on a practical scale. In this test, about half the sprouts were dead by the end of the first year after spraying. Two-thirds were dead a year after the second spraying, but the desired full control of brush on the experimental area did not come until after the third treatment.

Table 1.--Accumulative percentage kill on three species of sprouting brush sprayed with 2,4-D and 2,4,5-T in 1953, 1954, and 1955

Chemical and species	Plants sprayed in 1953	Accumulative kill		
		1st year	2nd year	3rd year
	Number	- - - Percent - - -		
2,4-D				
Live oak	24	33	71	75
Redberry	14	57	57	86
Blue oak	5	0	60	100
	43	37	65	81
50-50 mixture 2,4-D and 2,4,5-T				
Live oak	54	72	78	94
Redberry	17	41	76	100
Blue oak	47	60	62	100
	118	63	71	98
2,4,5-T				
Live oak	70	51	81	97
Redberry	14	21	64	100
Blue oak	16	31	37	87
	100	44	72	96
Total				
Live oak	148	56	78	93
Redberry	45	40	67	96
Blue oak	68	48	56	97
	261	51	71	94

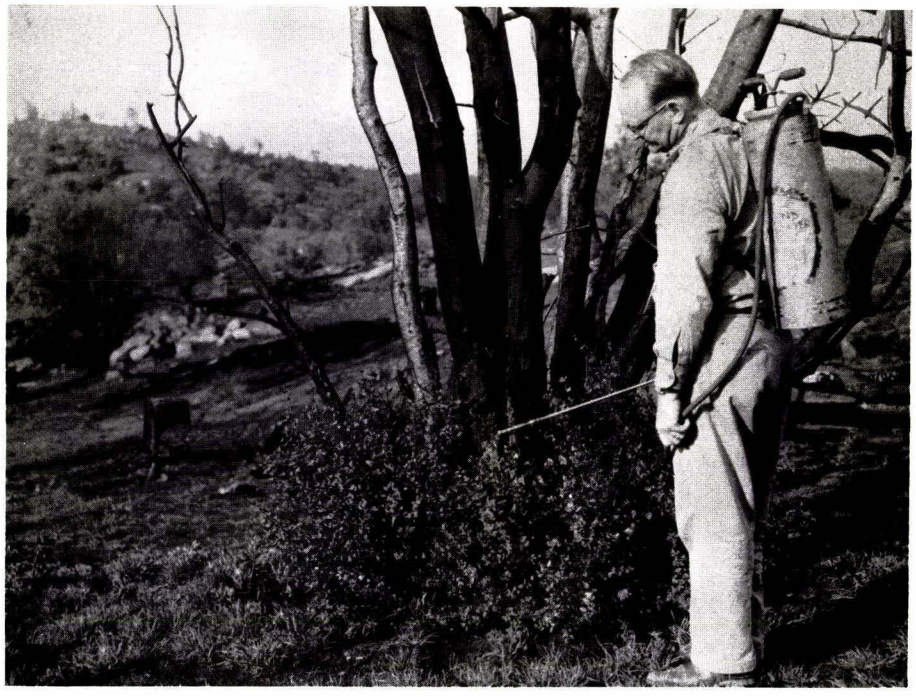

Figure 1.--Live oak sprouts should be hand sprayed with brushkiller in the 12- to 18-inch height stage. Standing dead stems as in this picture, impede efficient spraying. Coverage on sprouts could be improved by crushing and burning old stems ahead of spraying.

Another reason for recommending three consecutive annual treatments to control sprouts is that some plants are always missed. For example, the student who sprayed the experimental area in 1954, found 43 new plants that had come out after the first spraying in 1953, or had been missed. A single-shot job would have let these plants take over. As it was, they were sprayed for the first time in June 1954 and were dead when the final examination was made 2 years later. The desired degree of control had been obtained by spraying three times after burning.

This test also demonstrated that new sprouts should be sprayed when between 12 and 18 inches in height (fig. 1). At this stage the sprouts are growing actively, soil moisture usually is good, and less spray material is required per plant for good coverage. Moreover, it is easier to get good spray coverage on plants of this size than on larger ones. Finally, by the time most sprouts are 12 to 18 inches tall, sprouting from the root crown generally has stopped. No new sprouts appeared in any year after the June spraying.

Costs in this test averaged about 75 cents an acre per year for labor and 12 cents for material. The students sprayed slightly more than 2 acres per hour on the average, including the time required for mixing and changing spray solutions and keeping detailed experimental records. On a ranch, total cost per acre per year could easily be reduced to 75 cents or less. The costs are not excessive in view of the long-term benefits derived from the treatments. No grazable vegetation is lost as in the case of repeated burning for sprout control, and the range can be kept open indefinitely with a minimum of maintenance. In this experiment the cost of the entire 3-year spraying program amounted to the approximate value of the forage crop of 1 year.

CONCLUSION

Any stockman contemplating a chemical spray program should crush his brush before control burning. Crushing insures complete removal of the old stems which interfere with followup spraying. Also, crushing the brush is the only way to assure good burns. In any case, the spraying program should begin the first spring after burning--when the sprouts are 12 to 18 inches tall.

After a brushland fire the resident plant species regenerate by both seedlings and root-crown sprouts. The seedlings can easily be killed with chemical sprays, but when they are numerous, it is usually more practical to reburn the range once for seedling control. In the meantime the sprouts can be killed by the spraying program. The reburning also cleans up the woody material left by the original fire.

This pilot test demonstrated that crushing and burning brush followed by a suitable spraying program is a practical way to convert brush range into a stable grass-woodland type. The chemicals used will give full control of live oak, blue oak, and redberry sprouts if applied as recommended for 3 successive years.